



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 07:46 AM UTC

PDB ID : 8Z0U / pdb_00008z0u
Title : Human beta-catenin crystal structure
Authors : Tim, F.
Deposited on : 2024-04-10
Resolution : 2.21 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

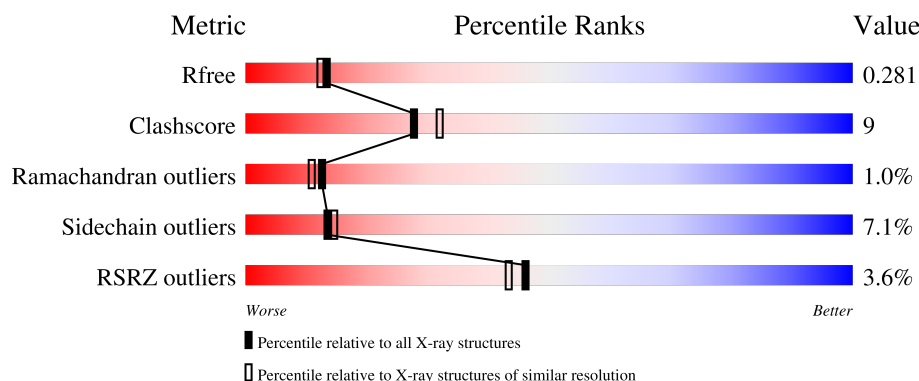
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.21 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7682 (2.24-2.20)
Clashscore	190562	8402 (2.24-2.20)
Ramachandran outliers	187476	8303 (2.24-2.20)
Sidechain outliers	187428	8304 (2.24-2.20)
RSRZ outliers	180081	7683 (2.24-2.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	549	

2 Entry composition

There is only 1 type of molecule in this entry. The entry contains 3752 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

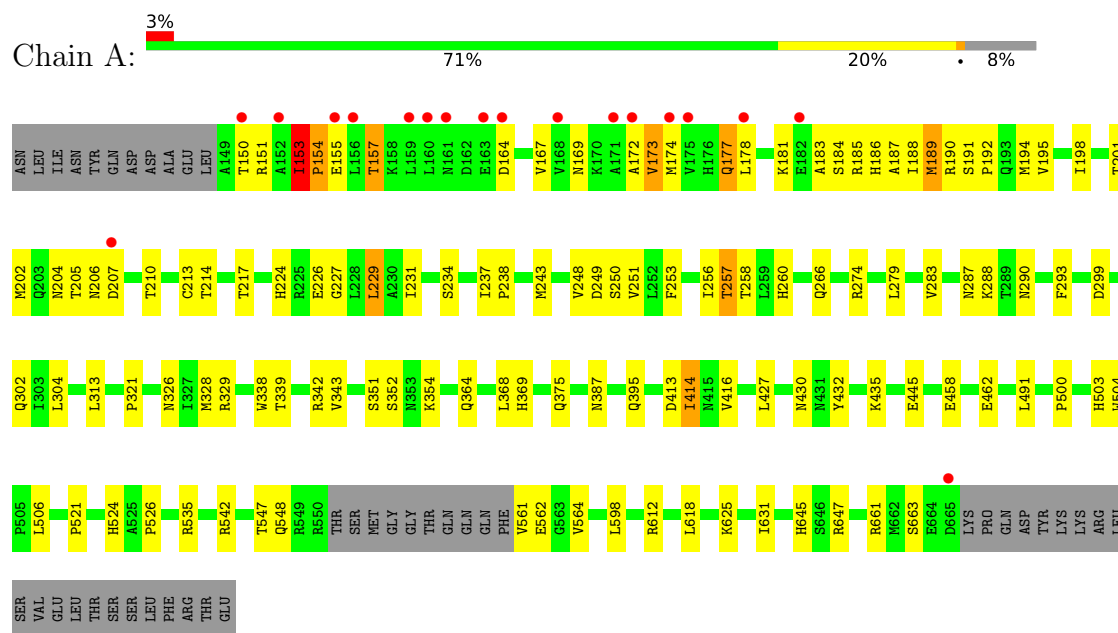
- Molecule 1 is a protein called Catenin beta-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	507	3752	2358	674	696	24	0	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Catenin beta-1



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	63.85Å 102.70Å 185.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	6.00 – 2.21 6.00 – 2.21	Depositor EDS
% Data completeness (in resolution range)	92.6 (6.00-2.21) 88.4 (6.00-2.21)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.84 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.219 , 0.281 0.227 , 0.281	Depositor DCC
R_{free} test set	1476 reflections (4.72%)	wwPDB-VP
Wilson B-factor (Å ²)	40.9	Xtriage
Anisotropy	0.017	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.52 , 53.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3752	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.96% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	1.13	6/3804 (0.2%)	1.19	10/5182 (0.2%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	430	ASN	N-CA	6.56	1.54	1.46
1	A	500	PRO	C-O	-6.56	1.17	1.24
1	A	183	ALA	C-N	5.85	1.42	1.33
1	A	427	LEU	C-N	-5.72	1.25	1.33
1	A	535	ARG	C-N	-5.43	1.26	1.33
1	A	645	HIS	CE1-NE2	5.26	1.37	1.32

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	150	THR	N-CA-C	7.54	120.96	111.69
1	A	430	ASN	N-CA-C	6.06	123.71	110.80
1	A	206	ASN	N-CA-C	-5.79	107.45	114.75
1	A	151	ARG	N-CA-C	5.74	120.30	112.04
1	A	177	GLN	O-C-N	5.43	127.74	122.09
1	A	612	ARG	NE-CZ-NH2	5.39	124.05	119.20
1	A	153	ILE	N-CA-C	5.32	120.37	108.88
1	A	504	TRP	CA-C-N	-5.30	113.07	118.85
1	A	504	TRP	C-N-CA	-5.30	113.07	118.85
1	A	612	ARG	NE-CZ-NH1	-5.24	116.26	121.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3752	0	3788	68	0
All	All	3752	0	3788	68	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 9.

All (68) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:207:ASP:HB3	1:A:210:THR:OG1	1.45	1.17
1:A:414:ILE:HD12	1:A:414:ILE:H	1.33	0.91
1:A:178:LEU:HG	1:A:188:ILE:HD11	1.51	0.90
1:A:364:GLN:HE22	1:A:395:GLN:HE21	1.13	0.88
1:A:178:LEU:HG	1:A:188:ILE:CD1	2.12	0.78
1:A:253:PHE:O	1:A:257:THR:HG23	1.83	0.78
1:A:364:GLN:HE22	1:A:395:GLN:NE2	1.82	0.77
1:A:189:MET:HG2	1:A:189:MET:O	1.85	0.75
1:A:185:ARG:HA	1:A:188:ILE:HD12	1.69	0.74
1:A:178:LEU:CG	1:A:188:ILE:HD11	2.20	0.72
1:A:328:MET:O	1:A:369:HIS:HE1	1.74	0.70
1:A:260:HIS:HE1	1:A:299:ASP:OD2	1.75	0.69
1:A:189:MET:HE3	1:A:226:GLU:HB2	1.73	0.69
1:A:207:ASP:CB	1:A:210:THR:OG1	2.32	0.68
1:A:458:GLU:OE2	1:A:503:HIS:HD2	1.78	0.66
1:A:190:ARG:O	1:A:192:PRO:HD2	1.97	0.64
1:A:227:GLY:O	1:A:231:ILE:HD12	1.97	0.64
1:A:326:ASN:ND2	1:A:329:ARG:HH21	1.95	0.64
1:A:172:ALA:C	1:A:174:MET:H	2.07	0.62
1:A:414:ILE:H	1:A:414:ILE:CD1	2.04	0.60
1:A:191:SER:O	1:A:195:VAL:HG23	2.01	0.60
1:A:491:LEU:HD12	1:A:526:PRO:HB2	1.84	0.58
1:A:201:THR:O	1:A:205:THR:HB	2.05	0.57
1:A:248:VAL:HG13	1:A:251:VAL:HB	1.87	0.57
1:A:237:ILE:HB	1:A:238:PRO:HD3	1.87	0.56
1:A:185:ARG:C	1:A:187:ALA:H	2.11	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:153:ILE:HB	1:A:154:PRO:HD3	1.87	0.56
1:A:178:LEU:CD2	1:A:188:ILE:HD11	2.36	0.55
1:A:458:GLU:HG2	1:A:506:LEU:HD22	1.88	0.55
1:A:521:PRO:HA	1:A:524:HIS:CE1	2.42	0.55
1:A:181:LYS:CB	1:A:184:SER:OG	2.56	0.54
1:A:153:ILE:C	1:A:155:GLU:H	2.17	0.52
1:A:202:MET:HG2	1:A:243:MET:SD	2.51	0.51
1:A:172:ALA:C	1:A:174:MET:N	2.67	0.51
1:A:173:VAL:O	1:A:177:GLN:HG2	2.11	0.50
1:A:178:LEU:HD11	1:A:184:SER:HB2	1.94	0.50
1:A:328:MET:O	1:A:369:HIS:CE1	2.62	0.49
1:A:339:THR:O	1:A:343:VAL:HG23	2.12	0.49
1:A:202:MET:CG	1:A:243:MET:HE2	2.42	0.49
1:A:153:ILE:HB	1:A:154:PRO:CD	2.43	0.48
1:A:157:THR:HG23	1:A:194:MET:HA	1.96	0.48
1:A:290:ASN:O	1:A:293:PHE:HB3	2.14	0.47
1:A:190:ARG:O	1:A:192:PRO:CD	2.62	0.47
1:A:229:LEU:HD22	1:A:266:GLN:OE1	2.14	0.47
1:A:202:MET:HG2	1:A:243:MET:HE2	1.97	0.45
1:A:326:ASN:HD21	1:A:329:ARG:HH21	1.64	0.45
1:A:432:TYR:HA	1:A:435:LYS:HD2	1.99	0.45
1:A:618:LEU:HD22	1:A:631:ILE:HG12	1.98	0.45
1:A:561:VAL:HG12	1:A:562:GLU:N	2.32	0.45
1:A:256:ILE:CG2	1:A:257:THR:N	2.80	0.45
1:A:302:GLN:HB2	1:A:343:VAL:HG22	1.99	0.44
1:A:354:LYS:HE2	1:A:387:ASN:O	2.18	0.44
1:A:413:ASP:HB3	1:A:416:VAL:HB	1.98	0.44
1:A:274:ARG:NH2	1:A:304:LEU:O	2.48	0.44
1:A:364:GLN:NE2	1:A:395:GLN:HE21	1.96	0.43
1:A:213:CYS:O	1:A:217:THR:OG1	2.25	0.43
1:A:542:ARG:HD2	1:A:542:ARG:HA	1.81	0.43
1:A:547:THR:HG22	1:A:548:GLN:NE2	2.34	0.42
1:A:178:LEU:CD2	1:A:188:ILE:CD1	2.96	0.42
1:A:547:THR:HG22	1:A:548:GLN:HE21	1.85	0.42
1:A:256:ILE:HG23	1:A:257:THR:N	2.35	0.41
1:A:164:ASP:HB3	1:A:167:VAL:CG2	2.51	0.41
1:A:256:ILE:HD12	1:A:256:ILE:HA	1.88	0.41
1:A:338:TRP:CE2	1:A:342:ARG:HD2	2.56	0.41
1:A:153:ILE:O	1:A:155:GLU:N	2.54	0.41
1:A:185:ARG:C	1:A:187:ALA:N	2.79	0.41
1:A:248:VAL:O	1:A:249:ASP:C	2.64	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:279:LEU:O	1:A:283:VAL:HG23	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	503/549 (92%)	469 (93%)	29 (6%)	5 (1%)	12 11

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	153	ILE
1	A	288	LYS
1	A	186	HIS
1	A	154	PRO
1	A	173	VAL

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	392/459 (85%)	364 (93%)	28 (7%)	13 14

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	157	THR
1	A	169	ASN
1	A	189	MET
1	A	198	ILE
1	A	204	ASN
1	A	214	THR
1	A	224	HIS
1	A	229	LEU
1	A	234	SER
1	A	250	SER
1	A	257	THR
1	A	258	THR
1	A	287	ASN
1	A	313	LEU
1	A	321	PRO
1	A	351	SER
1	A	352	SER
1	A	368	LEU
1	A	375	GLN
1	A	414	ILE
1	A	445	GLU
1	A	462	GLU
1	A	564	VAL
1	A	598	LEU
1	A	625	LYS
1	A	647	ARG
1	A	661	ARG
1	A	663	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	220	ASN
1	A	260	HIS
1	A	261	ASN
1	A	287	ASN
1	A	326	ASN
1	A	353	ASN
1	A	369	HIS
1	A	395	GLN
1	A	430	ASN
1	A	440	GLN
1	A	488	HIS

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Mol	Chain	Res	Type
1	A	503	HIS
1	A	538	GLN
1	A	544	HIS
1	A	545	GLN
1	A	548	GLN
1	A	601	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	507/549 (92%)	-0.40	18 (3%) 46 43	28, 45, 107, 136	0

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	159	LEU	5.4
1	A	160	LEU	5.3
1	A	178	LEU	5.1
1	A	163	GLU	5.1
1	A	174	MET	4.9
1	A	155	GLU	3.3
1	A	172	ALA	3.3
1	A	207	ASP	3.3
1	A	152	ALA	3.1
1	A	156	LEU	3.0
1	A	161	ASN	2.9
1	A	150	THR	2.7
1	A	168	VAL	2.7
1	A	164	ASP	2.7
1	A	175	VAL	2.5
1	A	182	GLU	2.4
1	A	171	ALA	2.2
1	A	665	ASP	2.1

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.